



1 Introduction

1.1 Disused or defective petrol storage tanks can be rendered permanently safe (permanently decommissioned) by one of the following methods:

- Exhumation, removal and (off-site) dismantling
- Exhumation and (on-site) dismantling
- Filling with concrete slurry or some other inert material
- Conversion to other storage (usually high flash point hydrocarbons like auto-diesel or gas oil)

Note: *A disused tank shall be defined as a tank that previously contained petroleum-spirit or fluid petroleum mixtures.*

1.2 The rendering permanently safe of underground petroleum storage tank(s) should only be undertaken by person(s) and/or companies specialising in the installation, maintenance and/or rendering safe of petroleum storage installations. 'FSPAN744 – Petrol Stations – List of Contractors'¹ lists a number of such specialist contractors.

1.3 The contractor carrying out the work to render a tank safe by whichever method should complete two copies of the decommissioning certificate. One copy should be left with the site operator and the other forwarded to the Licensing Authority.

1.4 Where it is intended to remove the storage tank or dismantle the tank on site, notification in writing together with a 'safety method statement' must be given to the West Yorkshire Fire & Rescue Service (Licensing Authority) before any work is commenced.

1.5 Where it is intended to render the tank safe in situ (filling with sand cement slurry or hydrophobic foam), the Licensing Authority must be informed at least 48 hours prior to the work being carried out, so that arrangements can be made for an Inspector to witness the filling. See section 4.

1.6 Petroleum Inspectors involved with contractors carrying out works to render permanently safe from the risk of fire and/or explosion petroleum spirit tanks, will ensure as far as is reasonably practicable that all works are to be carried out safely and in accordance with the procedures detailed in:

- HSG151²
- BS6187:2000³
- The Blue Guide⁴ (Section 6 - Construction & Construction Safety & Section 15 Decommissioning)

1.7 Additional and valuable guidance regarding model work control procedures and safety method statements can be found in the Institute of Petroleum's 'Code of Practice for Contractors Working on Petrol Filling Stations'⁵.

Note: *Petroleum Inspectors will refer any instances of inadequate safety method statements or unsafe practices to the Health and Safety Executive.*

2 Removal of residual petroleum product

2.1 If it is necessary to first remove the petroleum spirit stored or remaining in the tank, the contractor nominated to perform the uplift operation should comply with the procedures detailed

¹ FSPAN77 – Petrol Stations – List of Contractors

² Health and Safety Executive Guidance Note 151

³ BS6187:2000 – Code of Practice for Demolition

⁴ Guidance for the Design, Construction, Modification and Maintenance of Filling Stations (3rd Edition)

⁵ Code of Practice for Contractors Working on Petrol Filling Stations (ISBN 0 85293 1948)

in the Institute of Petroleum publication 'Guidelines for the Uplift of Product from Petrol Filling Stations and Customer Tanks'⁶.

- 2.2 Alternatively the contractor may follow any other recognised uplift procedure provided a method statement and risk assessment is submitted to the Licensing Authority prior to the commencement of the operation.

Note: *The consent of the local Petroleum Inspector must be obtained before petroleum-spirit is uplifted from any licensed storage tank.*

Except in an emergency situation (i.e., a known or suspected leaking tank) at least 48 hrs notice must be given to the Petroleum Inspector of the intention to uplift product.

- 2.3 Before any work commences on the rendering permanently safe of an underground petroleum storage tank, any residual petroleum product within the tank shall be removed, this is known as "bottoming".
- 2.4 As a condition of licence prevents the licensee from removing petrol from the tanks by any means other than the dispensing pump, arrangements have to be made for the attendance of a specialist contractor to carry out this work, (see 2.1 above).

3 Methods of inerting tanks

- 3.1 Before commencing the excavation and exhumation or the rendering safe in situ of an underground petroleum storage tank one of the following methods of inerting the tank to remove the risk of explosion shall be adopted by the competent person(s) and/or company(s) carrying out the task.
- 3.2 In the case of Nitrogen gas, dry ice, nitrogen foam and combustion gas, it is necessary to reduce the oxygen content to below 5%.

a. Nitrogen Gas

The condition of redundant petrol tanks may be uncertain, and therefore the atmospheric pressure method should be used. This method involves the Nitrogen being passed continuously into the tank at one point, while the air and petroleum vapour being purged leaves from another opening, usually the flame trap outlet.

It is recommended that the Nitrogen gas should be introduced directly from an industrial gas supplier's road tank vehicle that is fitted with the necessary reducing valves and measuring equipment.

The tank, and in the case of multi-compartment tanks, all compartments, should be bottomed, and all openings sealed except those required for the inlet of Nitrogen and for the exhaust outlet to atmosphere. *(The exhaust outlet should be of sufficient size so as to prevent the build-up of pressure in the tank).* The Nitrogen should then be introduced and the mixture leaving the tank should be vented to atmosphere so that the tank remains at atmospheric pressure throughout the entire operation. If approximately five tank volumes of nitrogen are used, the final oxygen level will be approximately 1%. Following completion of the purging, the openings should be sealed and the tank may then be excavated.

During the excavation and removal all holes found in the tank should be securely plugged with wooden plugs.

If excavation takes place immediately after purging the tank, a small vent should be left in the tank to allow excess pressure to escape.

b. Dry Ice

Following the bottoming of the tank, and in the case of multi-compartment tanks of each compartment, the ventilation pipes should be removed and all openings sealed except that required for the insertion of "dry ice" (solid Carbon Dioxide). 4kg should be allowed for each 2000 litres of capacity. The dry ice should be broken into pieces not larger than the size of a walnut.

WARNING - Operatives should wear gloves when handling dry ice, and should keep the ice covered whilst it is being broken to contain any flying fragments.

Once the dry ice has been added, the tank should be left for 12 hours. After this time, if oxygen levels of below 5% have been achieved, the opening used for the insertion of the dry ice should be sealed and the excavation can commence.

During the excavation and removal of the tank, any holes found should be securely plugged with wooden plugs.

If excavation takes place immediately after purging the tank, a small vent should be left in the tank to allow excess pressure to escape.

Note: With this method of inerting, difficulties can be encountered due to stratification, inadequate quantity of dry ice or incomplete transformation of dry ice to gas. It is therefore, important when using this method to test the atmosphere in the tank with an oxygen meter at intermediate levels. Particular care should be taken to test the atmosphere at the top of the tank.

c. Water Fill

Following the bottoming of the tank, and in the case of multi-compartment tanks, all compartments and suction pipe(s) should be disconnected and the tank connecting points effectively sealed. The tank should then be filled completely with water with care being taken to ensure that any water or residual product does not overflow from the fill point.

Surplus water or residual product should, if necessary, be removed from the fill pipe to avoid an outflow when the vent pipe is disconnected from the tank. Any surplus water or residual product should be disposed of safely.

Finally, the vent pipe should be disconnected and the tank connection point and fill point effectively sealed.

It should be remembered that when filling the tank with water, flammable vapours will be displaced through the vent pipe outlet.

Note: The effectiveness of the water fill method as an inhibitor is dependent on the tank remaining full of water during the whole of the excavation work. It is therefore important that periodic checks are made to ensure that there is no reduction in the water level during the course of the excavation work.

When the tank is ready for lifting from the excavation the water should be uplifted and conveyed to a site authorised for the handling and disposal of contaminated waste. Contaminated water from petroleum tanks is subject to the regulations made under the Environmental Protection Act 1990⁷. Disposal of contaminated water through the site separators should only take place following consultation with the local Environment Agency office.

Complications may occur with this method if the tank has holes or when the excavation is delayed causing flooding of the excavation. When this occurs the excavation work should stop, the water pumped out of the tank and an alternative method used instead.

⁷ Environmental Protection Act 1990

Other methods of inerting a tank, such as the use of combustion gas and hydrophobic foam are outlined in the Blue Guide.

4 Rendering Safe in Situ

a. Filling with Sand and Cement Slurry

This method involves completely filling the tank with a 20:1 sand cement slurry having a 175 millimetre slump according to EN 206-1 'Concrete Specification, performance, production and conformity'⁸. This mixture will set to form a solid homogeneous mass fill.

The tank, or all compartments, should be bottomed out as detailed in section 2. Prior to filling with slurry it will be necessary to inert the tank using one of the methods outlined in section 3.

The following points should be considered when planning or contemplating this method of decommissioning:

- the lid of the tank will have to be removed (and each compartment for a disused multi-compartment tank) to allow unrestricted access for the pouring of the sand cement slurry. The walls of the tank manhole chamber(s) may need to be demolished to facilitate access to the securing bolts on the lid and also removal of the lid.
- tanks that have been filled with sand cement slurry may cause problems should there be any subsequent redevelopment of the site.
- removing the tank lid should involve a 'permit to work' system of risk management.

Note: *Water Fill should not be used where a tank is known to be leaking.*

The pipework should be disconnected and tank lid should be removed in preparation for the sand/cement slurry filling. In the case of large tanks, prior arrangements should be made with the slurry producer to ensure continuity of road tanker supplies to complete the infilling during the course of the working day.

The slurry should be vibrated during pouring to remove air pockets and ensure complete filling of the tank.

Very old tanks without a manhole access cover require specialist treatment. In these circumstances hydrophobic foam may be the most suitable method eg. where there is no tank manlid opening and filling must be carried out through a restricted opening such as the fillpipe.

b. Filling With Hydrophobic Foam (Temporary safe in situ)

Hydrophobic foam is a substance that has the ability to absorb hydrocarbons and it is therefore not necessary to inert the tank before infilling. With this method of decommissioning there is no need to remove the tank lid as the foam is pumped into the tank through the fillpipe whether direct or offset. The manufacturer's/supplier's instructions should always be followed when utilising this technique and the following is a typical method:

- The tank should be bottomed as detailed in section 2. In addition it may also be necessary to treat the bottom of the tank with a proprietary emulsifier to ensure, so far as is practicable, all residual petrol is removed.
- The suction pipe(s) should be disconnected and the tank orifice(s) sealed. The vent pipe should be disconnected (in the tank lid access chamber) and a temporary ventilation outlet fitted by the contractor applying the foam.

⁸ EN 206-1:2000 'Concrete Specification, performance, production and conformity'
Page 4 of 7

- The foam that is generated on site should be pumped into the tank through a hose connected to the fill pipe. Filling should continue until foam discharges through the disconnected vertical section of vent pipe. The vent pipe should then be securely capped and additional pressure, typically 0.5 bar, should be applied to the foam in the tank to ensure that the tank is completely filled with the foam. Temporary Decommissioning is completed by securely replacing the tank fill cap and then filling the manhole chamber with foam, sand or concrete.

Where it is impractical to remove redundant pipework, the pipe can also be temporarily inerted by filling with the foam. In many cases this operation can be carried out simultaneously with the filling of the tank to which the tank is connected.

Note: *The contractor carrying out the foam fill should be advised of:*

- *the location of the tank lid in relation to its length as filling points in excess of 5 metres from the end of the tank require special treatment; and*
- *the total capacity of the tank.*
- *this method is deemed as temporary “safe in situ” with the requirement for periodic inspection by a competent person/contractor.*

c. *General Requirements*

It is essential that the infilling of the tank(s) is witnessed by a Petroleum Inspector and a minimum of 48 hrs notice is given to the Licensing Authority is required for this purpose. Where a tank is filled with concrete and the slurry filling has been completed to the satisfaction of the Licensing Authority, permission will be given for the manhole chamber to be filled with concrete where required.

The location of any tank abandoned in situ must be recorded by the occupier/owner and brought to the attention of any person who subsequently becomes responsible for, or acquires the site.

In order to avoid any possibility of future confusion the vent pipe riser(s) associated with the tank(s) must be dismantled and removed from site. This will also apply to any notices referring to petroleum spirit where the storage has ceased.

5 Conversion from petrol to another hydrocarbon liquid (excluding autogas)

- 5.1 Where a petrol storage tank is to be converted to diesel it is not necessary to clean the tank prior to refilling with diesel as long as the tank is completely filled and the entire system flushed through.

Where the petrol storage tank is to be converted to a hydrocarbon product other than diesel, the tank needs to be cleaned to ensure that no residues from the previous fuel will not contaminate the new product to be stored.

6 Tank Exhumation and Dismantling

6.1 *Exhumation*

Where a tank is being excavated and there is a danger that the surrounding earth may have been contaminated either by leakage from the tank or by spillage the following precautions should be taken:

- danger notices should be displayed;
- no smoking or naked lights should be allowed in the vicinity; and

Petrol Stations - Methods of Rendering Underground Storage Tanks Safe from Risk of Fire / Explosion

- a copious supply of water should be used to lessen the risk from sparking.

In all the above operations care should be taken to ensure that no petrol or petrol contaminated water is allowed to enter any drainage system or watercourse.

A tank may not be lifted by chains or wire ropes unless they are protected to prevent contact with the tank. Fibre ropes may be preferable for small tanks.

A tank may not be lifted by placing chains or ropes around the manhole neck as it is possible to rip the neck from the tank. After excavation, the words "PETROL HIGHLY FLAMMABLE" should be painted in clear and conspicuous letters at each end or on opposite sides of the tank.

6.2 *Transportation (for off-site dismantling)*

'The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 – Regulation 5(14)⁹ do not apply to the carriage of redundant tanks that are nominally empty. These Regulations will, therefore, not apply to tanks that have been properly prepared for uplifting by the following methods:

- cleaned and certified gas free; or
- bottomed and filled with hydrophobic foam; or
- bottomed and inerted using one of the methods detailed in Section 3

Tanks that have only been bottomed and inerted will also need the following precautionary work to be carried out in preparation for transport from site:

- all pipework connected to the tank should, as far as is reasonably practicable, be removed;
- all openings to the tank, including any pipework remaining attached to it should be sealed to prevent the escape of the inerting atmosphere or liquid;
- a suitable pressure relief valve should be fitted to the tank and individual compartments in the case of a compartmental tank; and
- any holes in the tank caused by corrosion or damage during exhumation should, so far as is reasonably practicable, be sealed to prevent the escape of the inerting atmosphere or liquid.

The person responsible for the removal of the tank should ensure that the recipient of the tank is made aware of the tank's previous use, the toxic hazard within the tank and the need to take adequate precautions against fires and explosions when dealing with it.

For specialist firm(s) who will receive and deal with receptacles that have contained highly flammable substances, please refer to 'FSPAN744 – Petrol Station - List of Contractors'¹⁰.

Prior to transportation, the Licensing Authority should ascertain the destination of the tank(s) and where this is to a place outside the West Yorkshire Fire and Rescue Service boundary, should inform the relevant Petroleum Licensing Authority.

5.3 *On Site Dismantling*

On site dismantling should only be carried out where the site is not currently used for storing petrol or where there is sufficient space for the work to be carried out safely. In addition to the preparation of a safety method statement, a risk assessment should be carried out to ensure that the dismantling work can be undertaken without endangering any persons on site, the general public and, where applicable, the remaining petrol installation.

Prior to the commencement of dismantling, the tank should be filled with water or cleaned out and degased. The risk of fire or explosion will be minimised by using only cold cutting

⁹ The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009

¹⁰ FS-PAN744 – Petrol Station – List of Contractors

techniques. The tank should be progressively taken apart from the top downwards after first cutting a large opening in the top of the tank (and where appropriate each compartment) to provide explosion relief.

Where a tank has been used for storing leaded petrol, additional precautions will be necessary in order to comply with the Control of Lead at Work Regulations 2002¹¹.

6 Legal Requirements

- 6.1 The Public Health Act 1961 (Section 73)¹² places a statutory duty on the occupier of a premise to 'take such steps as may be reasonably necessary to prevent danger from a disused petrol tank'.
- 6.2 The Health and Safety at Work etc. Act 1974 (S2)¹³ places a duty on the employer to provide a safe system of work and to ensure that employees and others that might be affected by the work are not put at risk.
- 6.3 The Dangerous Substances & Explosive Atmospheres Regulations 2002¹⁴ imposes a legal obligation on site operators and any site contractors to ensure that work to permanently decommission a petrol installation is carried out safely and that the installation is maintained or left in a safe condition.
- 6.4 The Health and Safety at Work etc. Act 1974¹⁵ also places a duty on an employee to take reasonable care of the health and safety of himself and of others who may be affected by his acts or omissions at work. Employees are required to co-operate with their employer to enable him to carry out his duties under the legislation, and not interfere with or misuse anything provided for his safety.
- 6.5 The Confined Spaces Regulations 1997¹⁶ impose requirements and prohibitions with respect to the health and safety of persons carrying out work in 'confined spaces'.

In the context of these Regulations a 'confined space' means any place, including any chamber, tank, vat, silo, pit, trench, pipe, sewer, flue, well or other similar space in which, by virtue of its enclosed nature, there arises a reasonable foreseeable specified risk of:

- serious injury to any person at work arising from a fire or explosion,
- the loss of consciousness of any person at work arising from an increase in body temperature; or
- the loss of consciousness or asphyxiation of any person at work arising from gas, fume, vapour or the lack of oxygen.

¹¹ Control of Lead at Work Regulations 2002

¹² The Public Health Act 1961

¹³ The Health and Safety at Work etc Act 1974

¹⁴ The Dangerous Substances and Explosive Atmospheres Regulations 2002

¹⁵ The Health and Safety at Work etc Act 1974

¹⁶ The Confined Spaces Regulations 1997